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United States Government | Department of Energy

memorandum

DATE: February 17, 1999

REPLY TO ATTN OF: Office of Environmental Policy and Assistance (EH-413):Coalgate;6-6075

SUBJECT: **MONITORED NATURAL ATTENUATION IN ENVIRONMENTAL RESTORATION**

TO: Distribution

PURPOSE

To provide Departmental elements with a synopsis of the Environmental Protection Agency (EPA) interim final policy, *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites* (Office of Solid Waste and Emergency Response Directive 9200.4-17; December 1, 1997).

The directive provides clarification of EPA's position on the use of monitored natural attenuation for the remediation of contaminated *soil* and *ground water* at sites subject to corrective action under the Hazardous Waste Program (Subtitle C) and the Underground Storage Tank program (Subtitle I) of the Resource Conservation and Recovery Act (RCRA), or remedial action under the Comprehensive, Environmental Response, Compensation, and Liability Act (CERCLA). The directive also discusses "strengths" and "weaknesses" of monitored natural attenuation. Finally, the directive informs EPA regions, the public, and the regulated community on how the Agency will use its discretion in implementing the use of monitored natural attenuation.

While the directive is intended to promote consistency with respect to proposals, evaluation, and approval of monitored natural attenuation remedial schemes, it does *not* provide technical guidance on the evaluation of these remedies. Notwithstanding, decisions to employ monitored natural attenuation as a remedy or remedy component must be adequately supported with site-specific characterization data and analysis.

MONITORED NATURAL ATTENUATION

The EPA defines monitored natural attenuation as "a reliance on natural attenuation processes (within the context of a carefully controlled and monitored site cleanup approach) to achieve site-specific remedial objectives within a time frame that is reasonable compared to that offered by other more active methods." These natural processes include physical, chemical, or biological processes that, under favorable conditions, and without the intervention of man, act to reduce mass, toxicity, mobility, volume, or concentration of contaminants in soil or ground water.

The potential advantages of relying on monitored natural attenuation include the following:

- Generation of lesser volumes/mass of remediation waste
- Reduced risk to human health and environment as a result of (1) conversion of contaminants to a less toxic form, (2) reduction of exposure levels, and (3) reduction in mobility and bioavailability;
- Minimized intrusion since fewer surface structures are required; and,
- Lower remediation costs.

In addition, potential disadvantages of monitored natural attenuation which must also be taken in consideration include:

- Longer remediation time frames may be necessary;
- Site characterization may be more complex and costly;
- Transformation products may be more toxic than parent compounds;
- Long term monitoring will generally be necessary;
- Institutional controls may be necessary;
- Continued contamination migration or cross-media transfer of contaminants may be possible;
- More extensive public outreach and education may be required; and
- Temporal changes in hydrogeology/geochemistry leading to renewed mobility of contaminants

The EPA considers monitored natural attenuation an appropriate remediation method only if it meets two conditions:

1. Its use will be protective of human health and the environment; and

2. It is capable of achieving site-specific remediation objectives within a time frame that is reasonable compared to other alternatives.

It is important to note that EPA does *not* consider monitored natural attenuation to be a "presumptive" or "default" remedy -- it is only one option that should be evaluated with other applicable remedies. In fact, the EPA expects that monitored natural attenuation will be the most appropriate when used in conjunction with active remediation measures (i.e., source control), or as a follow-up to active remediation measures that have already been implemented.

Furthermore, EPA does *not* consider monitored natural attenuation to be a "no action" or "walk away" approach, but rather considers it to be an alternative means of achieving remediation objectives that may be appropriate for a limited set of site circumstances where its use meets the applicable statutory and regulatory requirements. Monitored natural attenuation may be evaluated and compared to other viable remediation methods during the study phases leading to the selection of a remedy.

As with any other remedial alternative, monitored natural attenuation should be selected *only* when it meets all relevant remedy selection criteria, where it will be fully protective of human health and the environment, and where it will meet site remediation objectives, within a time frame that is reasonable compared to that offered by other methods.

A contingency remedy must be identified which will function as a back up remedy in the event the natural attenuation remedy fails to perform as anticipated.

In order to demonstrate compliance with these conditions, proponents of monitored natural attenuation must provide sound technical analysis demonstrating the ability of monitored natural attenuation its ability to achieve remediation objectives, undertake performance monitoring, and develop backup or contingency remedies where appropriate. Performance monitoring will be required as long as contaminant levels remain above the required cleanup levels.

POTENTIAL IMPLICATIONS FOR ENVIRONMENTAL RESTORATION

DOE elements can use the directive as an indicator of when to consider monitored natural attenuation as a remediation option and what they must do to present the best case for its use. Although the directive does not provide detailed technical guidance on how to make such a case, it does include a list of available references on the subject.

In addition to the "advantages" and "disadvantages" listed above, the following questions should be considered when deciding if monitored natural attenuation should be evaluated as a remedial option:

- Can the contaminants be effectively remediated through natural attenuation processes;
- Are the nature and distribution of sources of contamination compatible with natural attenuation processes;
- Is the plume relatively stable;
- what is the potential for environmental conditions to change over time;
- Will drinking water supplies or other environmental resources be adversely impacted by the use of monitored natural attenuation; and
- Will existing or proposed active remediation measures affect the operation of the natural attenuation process?

Even with all these considerations taken into account, monitored natural attenuation could be a very reasonable and attractive component of a remediation alternative. Its use could result in remediations which are less costly but still protective of human health and the environment.

DOE RELATED ACTIVITIES AND CONTACTS

As an adjunct to the Directive, the Offices of Program Integration (EM-43) and the Air, Water, and Radiation Division (EH-412) have developed a Monitored Natural Attenuation "Tool Box" which may be used to screen sites for potential implementation of MNA. The "tool box" can be accessed at *http://www.sandia.gov/eesector/gs/gc/na/mnahome.html*. In addition to the "tool box", EH-412 and EM-43 are in the process of finalizing a guidance document entitled Technical Guidance for Long-Term Monitoring Of Natural Attenuation at DOE Sites for use by environmental restoration project managers considering monitored natural attenuation as a remedial option. This document is currently in a draft stage with the final version expected to be available before the end of 1999. For further information regarding these efforts please contact Dr. Steven Golian (EM-43) at (301) 903-7791 or James Bachmaier (EH-412) at (202) 586-0341.

ACCESS TO DIRECTIVE

The Interim Final Monitored Natural Attenuation Policy (OSWER Directive 9200.4-17) is available on the Internet via the EPA home page at:
http://www.epa.gov/swerust1/directiv/d9200417.htm

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